Exterior Improvements

NOTE: This is a new section, which includes content from previous sections of the KU Design Standards, along with appropriate revisions and updates. Significant revisions or additions to the previous standards are highlighted in italics.

GENERAL
Designers shall verify that all applicable portions of these standards are incorporated into the project’s design, drawings, specifications and final construction. Requests for variances from these standards shall be submitted in writing to the DCM Project Manager, using the KU Standards Variance Request Form found in Appendix A1.1, for review and written approval or rejection as indicated on the form.

RELATED DOCUMENTS & REQUIREMENTS
Refer to the following for requirements that also apply to work of this section.

- **Division 1 - General Requirements**: Refer to sections regarding construction testing and field quality control requirements. Also contains additional information re: information that KU can furnish and the consultant’s obligations to field-verify existing conditions.
- Unless directed otherwise, the Owner shall separately contract for quality control testing during construction. Quality Control Testing of Sewer Lines: Video scans of sewer systems may be arranged for by the Owner, if appropriate.
- **Appendix A1.7 Standard of Practice - Accessibility**: Additional requirements that also apply to this section.
- **Campus Landscape Master Plan**: All projects shall be designed and constructed to be consistent with the Campus Landscape Master Plan. Current editions of this document can be viewed at the KU-DCM website: [http://dcm.ku.edu/resources](http://dcm.ku.edu/resources)
- **Division 2 - Existing Conditions**: Contains requirements for existing site conditions, site surveys, site plan drawings and demolition.
- **Division 3 – Concrete**: For requirements also applicable to site-related concrete work.
- **Division 5 – Metals**: Fabrication and galvanizing of exterior handrails and guardrails.
- **Division 9 – Finishes**: Requirements for KU’s standard exterior bronze paint color.
- **Division 12 – Furnishings**: Information and requirements for Site Furnishings - 129300, including seating, bike racks, trash/landfill and recycling containers.
- **Division 13 - Special Construction**: Bus shelters.
- **Division 22 – Plumbing**: Information applicable to site utilities.
- **Division 23 – Mechanical**: Information applicable to site utilities.
- **Division 26 – Electrical**: Information on site lighting and site utilities.
- **Division 27 – Telecommunication Systems**: Site infrastructure for telecommunications.
- **Division 31 – Earthwork**: Additional information regarding excavation, backfill, geotechnical reports and termite control.
- **Appendix A32.1 - Standard Site Details**: KU standard details to be used by Designers.
- **Division 33 – Utilities**: Utility tunnels and site utilities guidelines.
STREETS & PARKING LOTS – DESIGN GUIDELINES

Reference Standards: Comply with the following.

- "Standard Specification for State Road and Bridge Construction," Kansas Department of Transportation (KDOT)

Parking – Typical Dimensions:

- Drive Lane with 90-Degree Stalls on each side: 65' back-to-back is recommended overall dimension; 58' back-to-back is the minimum overall dimension.
- Parking Stalls: 8’-6” o.c. typical stall widths; narrower widths are not recommended.

Minimum Roadway Pavement Thicknesses:

- Service Drives & Parking Lot Drive Lanes: 8” asphalt (6” base course with 2” top course); or 6” concrete (minimums).
- Parking Areas: 6” asphalt (4” base course with 2” top course); or 6” AB-3 compacted base with 4” asphalt; or 6” concrete.
- Loading Dock Aprons: 8” to 10” concrete; verify thickness required for actual anticipated loading conditions
  - Do NOT use asphalt pavements in loading dock areas where trucks may be parked for extended periods of time.

Concrete Mix: 4,000 PSI minimum; 3” to 4” slump; 6% +/- 1% air-entrained concrete or KCMMB 4,000 PSI mix.

Reinforcement: Micro-fiberglass or ultra-fiberglass reinforcing shall be used within the concrete mix as the standard reinforcing component.

- Wire mesh reinforcing should not be used, given that it will rust and cause the concrete to deteriorate more quickly over time, and is often placed incorrectly.
- Steel reinforcing bars and bar supports shall be used as required to achieve proper engineering performance of the pavement design.

Joint work: Comply with recommendations of the Portland Cement Association (PCA).

- Consultants shall show all control and expansion joints in all pavements on site plans.
- Expansion joints shall utilize smooth steel dowels, pre-packaged onto carrier supports.

Striping: 4” wide; yellow (Sherwin Williams Pro-Pack Waterborne Traffic Marking Paint, Product Number B97YD2467) for typical stalls, accessible stalls, and centerlines. White for crosswalks.

Curb and Gutters: Cast-in-place concrete, reinforced, per KU’s standard details as shown in KU's standard detail drawings.

- Asphalitic curbs shall NOT be used.

Underground Conduit and Sleeve Location Markers: Provide 2” high "S" symbol marker cast or embossed into top of concrete curb above all underground conduit or sleeve locations.

Accessible Parking: Indicate accessible parking stalls on site plans.

- KU prefers to use universal stalls, as shown in the ADA Accessibility Guidelines, to greatest extent possible.

Service Vehicle Parking: Indicate on site plans at least one stall adjacent to each new or renovated building for temporary parking of delivery, service or maintenance vehicles.
- Verify location and quantity required with DCM and user group.
- KU Parking Department shall provide appropriate signage for each stall of this type.

**Signage:** KU Parking & Transit shall provide standard university signage for accessible, visitor or service parking stalls, as well as parking lot identification signage and directional signage. *KU will also provide vehicular and pedestrian signage if not being provided by the Contractor as part of the project's scope of work.*

- Designers shall provide posts for the mounting of accessible, visitor or service parking stall signage, unless KU agrees to provide the steel tube posts with the signage.
- *Project Designers shall show, or provide directions to Contractors, to ensure that all exterior signage is ADA-compliant, with special attention to compliance with the protruding objects limitations.*

**Fire Department Access Roads / Fire Lanes:** Designers shall integrate the requirements for fire department access roads and fire lanes into the project site, combining fire lanes with service roads wherever possible and where not possible, combining fire lanes with sidewalks.

- All fire lanes shall comply with the criteria required by the University Fire Marshal Authority (UFMA) and the Lawrence Fire Department (LFD).
  - Designers shall NOT contact or review fire lane requirements or options with the LFD prior to reviewing them with the University Fire Marshal.
  - All meetings and discussions with LFD shall be coordinated and managed by the UFMA on behalf of KU and the Project Designers.

- **Widths:** Fire lanes providing access for fire apparatus shall have an unobstructed width of 20’ minimum; or a 26’ minimum width when serving buildings over 30 feet high, for aerial equipment / outriggers.

- **Clear Height:** Fire lanes shall have an unobstructed vertical clearance of 13’-6” minimum for their entire length and width.

- **Public Roadway Connections:** Access to fire lanes also serving as sidewalks shall be via a roll-down curb at the public road providing the fire truck access.
  - Curb cuts shall extend not less than 2’ beyond each edge of the fire lane.

- **Approach / Departure Angles:** Shall not exceed 1:20 maximum, unless otherwise approved in writing by the Lawrence Fire Department.

- **Turning Radius:** Shall not be less than 25’ or as approved by UFMA and LFD.

- **Dead Ends / Turn-Arounds:** Fire lanes which exceed 150’ in length shall be provided with provisions for the fire apparatus to turn around which are acceptable to the University Fire Marshal Authority and the Lawrence Fire Department.

- **Load Capacity:** All fire lane pavements shall be designed by an Engineer of Record (EOR) to support a 75,000 pound fire apparatus.

- **Fire Lane Markings:** All fire lanes shall be marked with a red painted curb on each side of road/lane, with white text reading "FIRE LANE - NO PARKING ALLOWED" at intervals approved by UFMA and LFD.
  - If grass pavement systems are allowed, the outer boundaries of those fire lane pavements shall be marked by posts and signs along their edges at approved intervals.

- Temporary fire lanes shall be designed and documented to meet the same criteria.
Designers shall discuss options for minimizing the visual and physical impact of fire lanes with DCM and the University Fire Marshal, such as utilizing grass pavement systems along each side of a 10’ minimum concrete drive lane/sidewalk to achieve the required overall fire lane pavement width.

- Another option may be to include periodic 4’ wide planting beds down the middle of a full-width fire lane, with an engineered grid pavement with low-growing buffalo grass or similar (to avoid fire potential from hot exhaust systems); this system was utilized at the School of Pharmacy on West Campus.
- Another option may be to include a narrower drive lane and a wider pad at the fire truck attack position / designated staging location.
- The University Fire Marshal shall then discuss options which KU can support with the Lawrence Fire Department (LFD) to verify what is acceptable to both KU and LFD.

SIDEWALKS – DESIGN GUIDELINES

Accessibility:
- Sidewalks shall be designed to maintain slopes of less than 1:20 in all locations, to greatest extent feasible given the existing topography.
- ADA-compliant sidewalks are preferred over the use of ADA-compliant ramps for accessible paths.
- Designers shall pay special attention to maintaining and extending ADA-compliant accessible routes from all primary building entrances to accessible parking, loading zones and to other sidewalks and accessible routes across campus, particularly related to moving up and down the hills of campus.

Standard Sidewalk Widths:
- 8’ minimum width at main circulation walks
- 6’ minimum at secondary, less-heavily traveled walks
- 4’ minimum at incidental, low-traffic walks.
- Match widths of existing walks being extended or serving similar pedestrian traffic loads in the area of the new walks.

Standard Thickness: 5-1/2” (to handle maintenance vehicle traffic loads on walks).

Concrete Mix: 4,000 PSI minimum; 3” to 4” slump; 6% +/- 1% air-entrained concrete.
- Granite aggregate shall be used on all sidewalks, to minimize potential for shale aggregate ‘popping’ and pock-marked surfaces.

Reinforcement: Micro-fiberglass or ultra-fiberglass reinforcing shall be used within the concrete mix for standard reinforcing.
- Supplemental steel bar reinforcing shall be provided if and where required to achieve proper engineering performance.
- Wire mesh reinforcing should not be used, given that it will rust and cause the concrete to deteriorate more quickly over time.

Expansion & Control Joints: Designers shall show on site or floor plans.
- Expansion joints shall be required at all walk to curb, manhole, structure or building abutments, and at no greater than 40’ o.c. in continuous walks or slabs in each direction.
- Expansion joint details shall require ½” diameter x 12” long smooth dowels at 18” maximum o.c., centered in depth of walk and set perpendicular to walk’s long dimension.
Expansion joints shall be detailed to indicate sealant on top of ½" thick joint filler.

Control joints shall be detailed to be sawcuts or tooled / trowel-cut joints, penetrating not less than one-fourth the depth of the concrete walk or slab.

- For KU's standard 5-1/2" thick walks, the sawcut / trowel-cut joints shall be 1-3/8" minimum deep.

Subgrade: Required to be undisturbed or compacted earth subgrade, or low-volume-change (LVC) granular fill may be used for subgrade as approved by the engineering geologist.

- Sand is NOT an acceptable subgrade backfill or leveling material under walks or slabs.

Thickened Edges: Exposed edges of all sidewalks and each side of expansion joints shall be detailed to be thickened to be not less than 8" deep, with bottom of thickened edge angled up to bottom of walk at no more than 45 degree slope.

Finish: All exterior walks and slabs shall receive a medium broom finish, perpendicular to the primary direction of travel.

- Light broom finishes or smooth/polished exterior walkway surfaces are NOT acceptable.

Site Furnishings: Refer to Division 12 - Furnishings for specific requirements.

- Designers shall include sidewalk extensions adjacent to one or more ends of benches for adjacent wheelchair 'parking' or 'seating', so benches can serve as ADA-compliant companion seats.

- Designers shall also provide sidewalk extensions so persons in wheelchairs can access recycling or waste containers, newspaper racks and posted reading materials.

EXTERIOR STAIRS – DESIGN GUIDELINES

Comply with KU's standard details and the provisions/clarifications noted in the section.

- Cheek Walls: Omit unless required to accommodate adjacent grading, or if in an area where existing stairs have cheek walls.

- Handrails and Guardrails: All steel handrails and guardrails shall be fabricated from 1-1/4" nominal O.D. (1-5/8" actual O.D.) Schedule 40 steel, with all joints fully-welded and ground smooth, and shall be fully hot-dip galvanized after fabrication.

- Designers and contractors shall not use 1-1/2" nominal O.D. (1-7/8" actual O.D.) pipe for handrails.

- Handrails shall be painted with KU's standard exterior bronze color paint; refer to the Division 9 paint standards for details.

- Handrail and Guardrail Embedment: Details shall show 3" side clearance from edge of embedded handrail posts to outside face of concrete, to reduce potential for edge-spalling of concrete due to long-term corrosion or water penetration.

- Handrails shall be embedded in cored holes or galvanized steel sleeves which have an interior dimension approximately 3/4" larger than the exterior of the handrail, in order to create a 3/8" wide annular space around the embedded pipe.

- The annular space shall be filled with non-shrink grout which shall fully fill this gap and shall extend above the surface of the concrete, shall be tight to the post and shall be sloped to drain away from the pipe on all sides.

- Sealant or calking shall not be used in lieu of non-shrink grout, since it will crack and shrink over time, allowing water to enter the gap and freeze/thaw damage the concrete and eventually rust the pipe.
ACCESSIBLE CURB RAMPS – DESIGN GUIDELINES
Accessible curb ramps shall be provided at each location where accessible paths abut curbs. Brick pavers in accessible curb ramps shall be installed along the back of the curb line, to designate where the roadway hazard begins. Bricks shall be curved along the back of curved curb/gutter lines; minor tight-fitting wedge-shaped gaps between curved pavers is acceptable.

☑ Comply with provisions of the Americans with Disabilities Act, and KU's standard curb ramp details.

☑ Designers shall include KU's standard curb ramp details, as shown in Appendix A32.1, in the bid documents.

☑ Detectable Warning Brick Pavers (4" x 8" x 1-1/4" thick):
  ☐ Endicott Clay Products Co., Medium Ironspot #77
  ☐ Endicott, Medium Ironspot #46 may be considered as an option, if approved by DCM on a per-project basis, and only in areas where the standard #77 brick color is not already used in adjacent construction.

BICYCLE PARKING AREAS – DESIGN GUIDELINES
General: Project Designers are encouraged to become familiar with the 'Bike KU' webpage, maintained by the KU Office of Sustainability, for current guidelines, resources and recommendations to support and facilitate bicycle use at KU.

The University has considerable bicycle traffic and has adopted a standard for bicycle parking rails. Areas heavily used as bicycle routes should be identified for development of bicycle parking as part of each major project.

☑ Each project shall include bicycle parking in an unobtrusive, but visible and easily reached area near each building entrance, dispersed to accommodate bicyclists arriving from any direction to logical building entrance points, in sufficient quantities to handle the currently anticipated and future needs.

☑ KU’s standard bike rack detail, as shown in Appendix A32.1, shall be included in the construction drawings.

☑ Bicycle parking areas shall be visually screened by 3’ to 4’ high shrub borders on all sides facing main vehicular and pedestrian pathways.

RETAINING WALLS – DESIGN GUIDELINES
Retaining walls shall be constructed of appropriate materials for the context of each location, and shall be one of the following materials.

☑ Low Walls (typically 3’ or less): Concrete, concrete masonry units or stone materials.

☑ Medium to Tall (3’ or higher): Reinforced concrete, with a sandblasted or otherwise appropriate decorative finish and rustication joint patterns. Also required for walls supporting significant lateral loads.
  ☐ Alternative materials or systems, such as concrete masonry units, may only be used in taller retaining walls with project-specific approval from DCM and if recommended and approved by the project’s structural engineer.

☑ Retaining wall materials and details shall be consistent with and appropriate to the historic context and landscaping materials used in the area of the proposed site.
Concrete Masonry Retaining Walls: If used, they shall be provided in straight (not curved front) split-face units, in a running bond pattern, with reinforcing or tie-backs and fully-drained backfill and foundation drainage systems as required by the system manufacturer and the project’s geotechnical engineer to provide a permanent, stable system.

HOT- MIX ASPHALT PAVING – 321216
Asphaltic Concrete Base Course: KDOT Section 1103, Mix BM-2B
Asphaltic Concrete Surface Course: KDOT Section 1103, Mix BM-2
Gravel Surfacing Aggregate: KDOT Section 1111, Type SA-1 or SA-X
Base Aggregate: KDOT Section 1111, Type AB-3

IRRIGATION SYSTEMS - 328400
General: KU does not typically irrigate lawns and turf areas, but planting beds are typically to be provided with automatic irrigation systems.

- Irrigation systems may be appropriate in limited or highly-visible turf areas, or where FS maintenance access is limited. Verify with DCM Landscape Architect and FS Landscape Manager.
- Underground irrigation systems may utilize automatic pop-up heads or may provide quick disconnects for hoses and sprinkler devices to be manually attached by the Owner. Verify which types of systems are appropriate for each project with the DCM Landscape Architect and FS Landscape Manager.

Lawn Sprinkler System Piping: PVC, Schedule 40, rated for 160 psi.
Backflow Preventers: Provide on each irrigation system water service line. Locations inside buildings are preferred to exterior pits.
Sprinkler Components: Weathermatic, RainBird or Hunter.
Controls: Review options for including KU’s central building automation control system (BACS) components as part of sprinkler system controls with KU Landscape Architect, FS and DCM personnel.

- Controllers shall only be units manufactured by Hunter, with SmartPort remote capabilities, for compatibility with FS maintenance devices.
- Controllers shall be accessible from outside the building for ease of access at all times by FS personnel.

TURF AND GRASSES – 329200
Seed and Sod: Project Designer shall edit KU’s standard specification section, included herein as Appendix A32.2, as applicable for each project and include it in the bid documents.

- All disturbed areas, fills and embankments shall be repaired by reseeding or resodding in accordance with KU’s standard specification’s requirements. All areas driven on must be aerated and overseeded. All areas where turf is damaged must be stripped of turf, lightly composted and seeded.
- Seeding rate may vary and shall be determined in consultation with the University Landscape Architect.
- Buffalo Grass: Consult with the University Architect, DCM Landscape Architect and Facilities Services Landscape Manager if developing new lawns on KU's West Campus.
or in other areas outside of the core campus, to determine if buffalo grass is an option that KU may wish to implement, in order to reduce long-term maintenance demands in those areas. If used, Designers shall confirm and comply with KU's directions on the buffalo grass seed specification, timing for seeding and other related details.

- Buffalo grass should not be used on KU's Main Campus.
- It should be considered in other areas where a consistent green appearance isn't required and where limited foot traffic is anticipated.

- Native Grasses: Native grasses are not to be used for lawn or turf areas. If proposed for use in limited or accent locations, they shall only be used as specifically approved by the University Architect, DCM Landscape Architect and FS Landscape Manager, on a project-specific basis.

- Synthetic Turf: It may be appropriate to utilize synthetic turfs for heavily-used recreational or competitive athletic fields, but they may only be used as specifically approved by the University Architect, DCM Landscape Architect and FS Landscape Manager, on a project-specific basis.

**Temporary Staging Areas:** Project Designers shall include provisions which require Contractors to repair and restore damaged lawn areas in accordance with KU's standard specification's seeding and sodding requirements for all projects, including projects that may be limited to interior remodels or renovations, but which may utilize exterior areas for site access, temporary staging or storage areas, or contractor parking.

**EXTERIOR PLANTS – 329300**

**General:** Plants shall be true to name and shall conform to the grading criteria set forth in the "USA Standards for Nursery Stock".

- The University Landscape Architect in the Office of Design and Construction Management shall inspect all plant materials prior to commencing with planting work. No plant excavations shall be undertaken by the Contractor prior to the approval of the University Landscape Architect.

- DCM Surveying shall be consulted for location of underground utility lines, which must be taken into account in the excavation of the planting areas.

- Remove planting debris from project site.

**Maintenance of Plantings:** The Contractor shall be responsible for maintaining plants in healthy growing condition until the date of acceptance by the University Landscape Architect.

- Plants shall be warranted for a period of one year after the date of acceptance by the University Landscape Architect.

- Any plants that do not survive in good condition past this time period, as judged by the University Landscape Architect, shall be replaced at no additional cost to the University and warranted for an additional nine months from the date of their re-acceptance.

**VEGETATED ROOF ASSEMBLIES – 329700**

**General:** Green roofs and rooftop plantings shall only be used as approved by DCM, on a project-specific basis. If approved, they shall include the following features:

- Plant materials in trays, which facilitate easy removal for maintenance of the roof membrane.

- An irrigation system to automatically water all plantings.
- Walkway paths for inspection and maintenance of the plantings, roof edges, flashings, rooftop-mounted equipment, and similar items.

- A roof membrane under the green roof from a manufacturer who offers written approval of the green roof system being installed upon it, and which includes the same warranty period of coverage for the roofing in the green roof system as in other proposed roofs on the new or renovated facility.